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AN ANALYSIS OF THE DEATH RATE OF DETROIT*

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IN AN EXAMINATION of the death rate of the City of Detroit, the first element to be considered is that of population. In the decade 1910 to 1920 the City of Detroit more than doubled its population, increasing from 465,766 in 1910 to 993,678 in 1920. Probably no other community as large as this has ever grown to this extent in the same time. It is unnecessary, of course, in this paper to go into the reasons for this growth; we are simply considering the fact. While a large number of young mechanics were attracted to the city, there was also a large foreign immigration. This resulted in a distortion of the population when considered in relation to sex and age. In order to determine just what this distortion is, let us first consider the age and sex distribution in comparison with that of the standard million.

The first thing that will be noticed is the distribution of sex. In the standard population there should be 48.35 males to 51.65 females, but in Detroit this is completely reversed there being 54.36 males to 45.64 females. This may be represented by the ratio in the standard as 1 to 1.068 and in Detroit as 1.191 to 1.

Table 1 shows the number of the population in each age group as compared with the proportion of the standard million. It will be found that below the age of 20 there was a marked deficiency. Between the ages of 20 and 45 there was a great excess and from this age on there was a marked deficiency again. In the males it will be found that the group under 5 years of age was very nearly the standard, but that from 5 to 19 there was a considerable deficiency, amounting to almost 50 per cent in the group 10 to 14, but from the ages 20 to 55 there was a very great excess. In the 25 to 34 group this amounted to almost 84 per cent, or to put in actual figures where the standard was 75,876, the Detroit population was 139,492, an excess of 63,616. Above the age of 55 there was again a deficiency. In the female population there is a marked deficiency in all age groups under 20. Between the ages of 20 and 34 there was an excess very slight in the 20 to 24 group, but quite marked in the 25 to 34. Above the age of 25 there was a deficiency in all age groups. These are illustrated in Figures I, II and III.

As a further illustration of the age distortion of this population, attention is invited to Table II, in which comparison is made of the percentage of deaths in each age group in Detroit as compared with the percentage in the United States Registration Area in 1920. It will be

* Read before the Vital Statistics Section of the American Public Health Association at the Fifty-fourth Annual Meeting at St. Louis, Mo., October 21, 1925.

FIGURE I

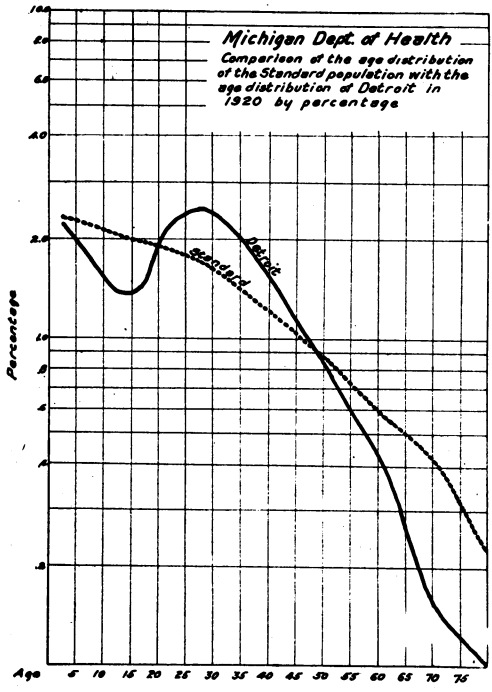


FIGURE II

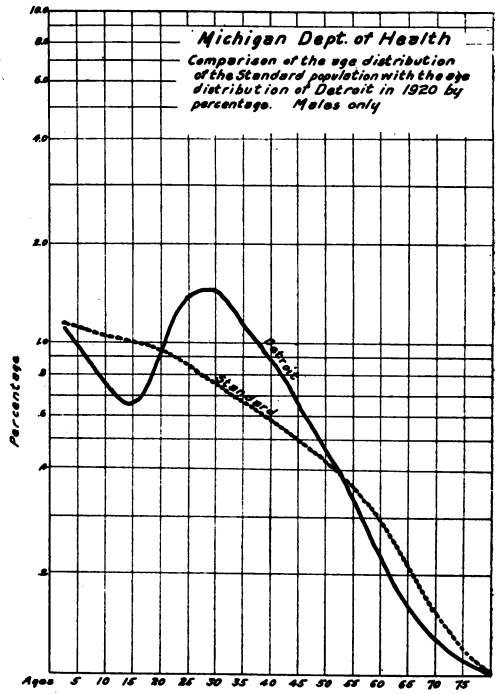


TABLE I

COMPARISON OF THE AGE AND SEX DISTRIBUTION OF DETROIT (1920 CENSUS) WITH THE DISTRIBUTION OF THE STANDARD MILLION

Age	Total		Males		Females	
	Standard	Detroit	Standard	Detroit	Standard	Detroit
0–4	113,442	112,117	56,629	56,669	56,812	55,448
5–9	106,439	88,245	53,076	44,314	53,361	43,931
10–14	101,997	68,702	51,001	34,504	50,996	34,198
15–19	99,079	70,156	49,065	35,416	50,014	34,740
20–24	95,257	109,458	44,948	59,032	50,308	50,426
25–34	160,418	241,609	75,876	139,492	84,545	102,117
35–44	121,967	150,079	58,967	88,562	62,999	61,517
45–54	88,582	83,989	42,616	47,323	45,965	36,666
55–64	59,312	43,755	27,713	22,807	31,600	20,948
65–74	32,842	16,120	14,586	8,425	18,257	8,996
75 and over	13,483	8,588	5,592	3,099	7,892	4,188
Total	992,818	992,818	480,069	539,643	512,749	453,175

	Standard	Detroit
Males	480,069	539,643
Females	512,749	453,175
	992,818	992,818

observed that up to the age of 5, the percentage of deaths is continuously higher in Detroit; in the group 5 to 9 it is identical; and from 10 to 19 it is below; but from then on until the age of 60 it is very much higher. Above the age of 60 it is slightly below.

This distortion of population, naturally, radically affects the death rate and for this reason this study seemed worth while. In every statistical study we are confronted with the limitations of data and this is true in this case. No one can tell definitely the increase in the population since 1920 until the new census which was just taken shall become available, but for the purposes of this study we have taken the deaths from 1919, 1920 and 1921 and averaged them. We realize that this does not present an ideal combination because of the fact that 1919 following the influenza pandemic of 1918 naturally showed a low death rate because of the loss of the weak members of society due to the influenza of the previous year. Again, the spring of 1920 showed a recurrence of influenza with a high fatality, but in

spite of these considerations, it was deemed wise to take this group.

The number of deaths considered was 11,640 and the nativity and sex are shown in Table III.

In the Detroit population the native white of native parents comprise 31.6 per cent of the total population and the negroes 4.2 per cent. The balance of the population, 64.2 per cent, was either foreign born or native born of foreign mothers and we have learned that in relation to public health work, the first generation American, that is the native born of foreign race stocks, will present in a measure at least the thought, characteristics and instincts of the foreign stocks and for this reason the native born of foreign mothers have been considered separately so far as we have available data. In this 64.2 per cent we have foreign born 29.1 per cent, native born of foreign mothers 16.4 per cent and a third group of "mixed parentage" 18.7 per cent. This latter group has been largely omitted from the study. Table IV shows the relation of these population groups to the deaths.

It would appear from this table that the native born of native parents, the foreign born and negroes all presented death rates that were in excess of the expectancy and that the native born of foreign mothers and native born of

FIGURE III

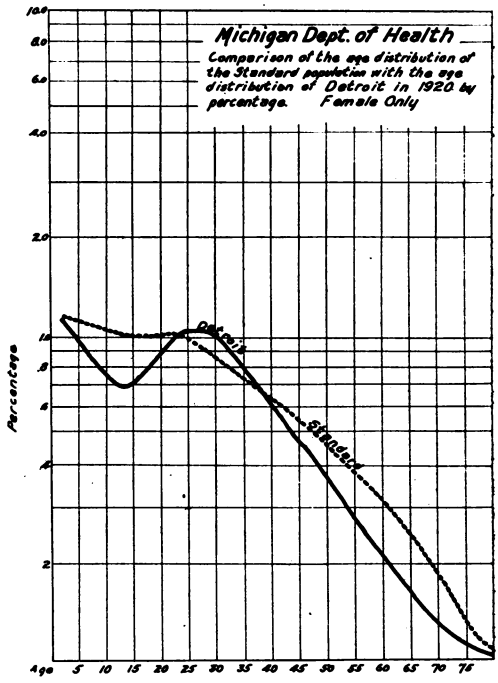


TABLE II

COMPARISON OF THE PERCENTAGE OF DEATHS BY AGE AND SEX BETWEEN THE U. S. REGISTRATION AREA AND DETROIT

Age	U. S. Registration Area			Detroit		
	Males	Females	Total	Males	Females	Total
Under 1	8.70	6.61	15.31	10.51	8.20	18.71
1	1.73	1.51	3.24	1.76	1.60	3.36
2	.78	.70	1.48	.89	.96	1.85
3	.51	.49	1.00	.55	.50	1.05
4	.39	.35	.74	.42	.42	.84
5–9	1.27	1.10	2.37	1.27	1.21	2.48
10–14	.91	.79	1.70	.78	.54	1.32
15–19	1.39	1.35	2.74	1.29	1.14	2.43
20–24	1.78	2.07	3.85	2.46	2.16	4.62
25–29	2.02	2.34	4.36	2.94	2.54	5.48
30–34	2.16	2.23	4.39	3.71	2.12	5.83
35–39	2.40	2.17	4.57	4.08	2.17	6.25
40–44	2.23	1.94	4.17	3.41	1.90	5.31
45–49	2.50	2.05	4.55	3.34	2.14	5.48
50–54	2.81	2.28	5.09	3.18	2.02	5.20
55–59	2.97	2.44	5.41	3.22	2.15	5.37
60–64	3.48	2.90	6.38	3.19	2.68	5.87
65–69	3.60	3.11	6.71	2.89	2.42	5.31
70 plus	10.77	11.17	21.94	6.13	7.10	13.23

TABLE III

SEX AND NATIVITY OF DEATHS

	Males	Females	Total
Native born of native parents	2,338	1,896	4,234
Born in Poland	399	226	625
Born in Canada	420	444	864
Born in Germany	413	328	741
All other foreign born	896	572	1,468
Native born (Mother born in Poland)	287	253	540
Native born (Mother born in Canada)	197	175	372
Native born (Mother born in Germany)	262	258	520
Native born (Mother born in all other foreign countries)	642	563	1,205
Negro	667	404	1,071

"mixed parentage" were much below, but this does not take into consideration the most important factor of age distribution. While the percentage of foreign population in Detroit is very large and as a rule it is the adults that are added to a population by immigration, in order to get some idea of the effect of

TABLE IV

RELATION OF NATIVITY TO DEATHS

	Percentage of Population	Percentage of deaths
Native born of native parents.	31.6	36.4
Foreign born	29.1	31.8
Native born of foreign mothers	16.4	12.3
Native born of "mixed parentage"	18.8	10.4
Negroes	4.2	9.2

this foreign population we have next prepared what may be termed crude death rates for the following groups: native born of native parents; persons born in Poland; persons born in Canada; persons born in Germany; and persons born in all other foreign countries; also, the native born of Polish mothers; native born of German mothers; native born of Canadian mothers; and for negroes. These groups have been selected because they were the only groups for which we were able to secure age and sex distribution from the Bureau of the Census. It would have added much to the value of this article if we could have used also the native born of all other foreign mothers, but this information was not available as it was concealed in the classification "Mixed Parentage." These rates are shown both for the total in the group and for each sex and will be found in Table V.

Next we have compared age of these groups by standardizing the rates. The process of standardization adjusts the difference in age and sex distribution and it should be borne in mind that where the standardization of a rate increases the rate for the crude figures, it is due to the fact that the age distribution is more favorable toward the production of a low death rate than would be found in the standard population and where the standardized rate is lower than the crude rate, it indicates that the age distribution of the population is unfavorable toward the production of a low death rate.

The comparison of the crude and standardized rates is shown in Table VI.

In the comparison of the crude and standardized rates, it will be observed that there is a very considerable discrepancy between the crude and standardized rates. This is due, at least in a measure, to the fact that in some of the native groups, particularly in the lower ages, we are dealing with such small numbers, that the accidental variation may be very

TABLE V

SHOWING CRUDE DEATH RATES FOR EACH NATIVITY

	Males			Females			Total		
	Population	Deaths	Rate	Population	Deaths	Rate	Population	Deaths	Rate
Native	170,417	2,338	13.72	143,270	1,896	13.23	313,687	4,234	13.50
Poland	22,059	399	18.09	13,604	226	16.61	35,663	625	17.53
Canada	20,793	420	20.20	21,121	444	21.02	41,914	864	20.61
Germany	18,173	413	22.73	17,385	328	18.87	35,558	741	20.84
All other foreign	107,848	896	8.31	68,020	572	8.41	175,868	1,468	8.35
Mother (Poland)	17,105	287	16.78	17,035	253	14.85	34,140	540	15.82
Mother (Canada)	22,136	197	8.90	22,424	175	7.80	44,560	372	8.35
Mother (Germany)	41,270	262	6.35	42,442	258	6.08	83,712	520	6.21
Mother (All other foreign)	.....	642	.....	.....	563	.....	.....	1,205	.....
Negro	24,177	667	27.59	17,325	404	23.32	41,502	1,071	25.81
Not taken	95,665	...	.....	90,549	...	.....	186,214	.....	.....
	539,643	6,521	12.08	453,175	5,119	11.30	992,818	11,640	11.72

TABLE VI

COMPARISON OF THE CRUDE AND STANDARDIZED DEATH RATES

	Crude Death Rate			Standardized Rate		
	Males	Females	Total	Males	Females	Total
Native born of native parents	13.72	13.23	13.50	19.4	17.51	18.60
Born in Poland	18.09	16.61	17.53	19.0	32.85	31.00
Born in Canada	20.20	21.02	20.61	29.7	26.75	29.09
Born in Germany	22.73	18.87	20.84	7.5	7.93	8.68
All other foreign born	8.31	8.41	8.35	10.5	8.57	8.34
Mother born in Poland	16.78	14.85	15.82	45.5	11.61	41.92
Mother born in Canada	8.90	7.80	8.35	12.2	11.33	11.76
Mother born in Germany	6.35	6.08	6.21	10.2	10.39	10.47
Negro	27.59	23.32	25.81	41.0	35.26	38.26

FIGURE IV

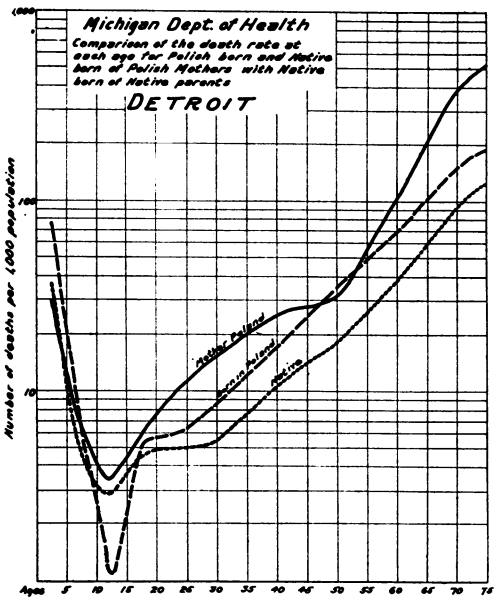
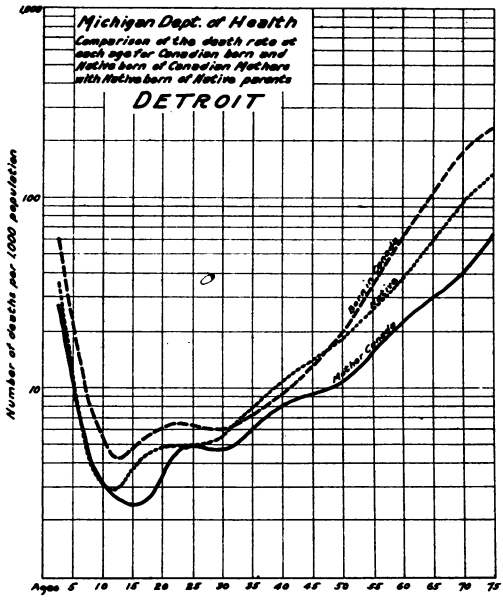


FIGURE V



marked. In the case of the foreign born, we have a marked discrepancy in the lower ages, whereas in the case of the native born of foreign mothers, we have a normal distribution in the lower age groups, but a deficiency in the higher age groups.

It would therefore be well to standardize these in groups over the age of 25. For instance, in the German born we find a crude rate of 20.84, falling to a standardized rate of 8.68. On the other hand, if we take the group of 25 years and over, we find a rate of 25.17, falling only to 16.67. It is suggested, therefore, that if it is desired to intensify this study, that these factors be taken into consideration and also that these figures be subjected to the standard tests for dependability.

In the consideration of the specific death rates for these various groups, we have used the curve of the native white of native parents as the control and in the following charts this is shown on each one.

In the consideration of the Polish residents, Figure IV, it will be observed that in the group 10 to 14 the specific death rate for the Polish born is very much below the native born, but that in all other ages it is uniformly higher presenting the same trend. In the consideration, however, of the native born of Polish mothers between the ages of 15 and 45 this is materially higher than either the Polish born or native born. About the age of 50 it is slightly below the Polish born, but above the age of 55 it is very much higher. In the Polish born below the age of 9 the rate is materially higher than either the control or native born of Polish parents.

In the consideration of the Canadian group, Figure V, we find that native born Canadians show a much higher rate than either the control or the native born of Canadian mothers below the age of 30; between the ages of 30 and 45 it is slightly below the control but above the native born of Canadian mothers. At or about this age it again crosses the control and from then on is very much higher. In the native born of Canadian mothers the rate under 5 is quite a little below the control, and between 5 and 9 is very close to the control, from then on it is consid-

FIGURE VI

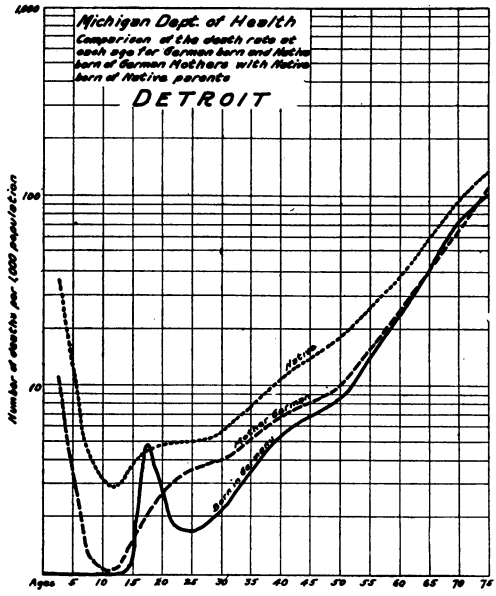
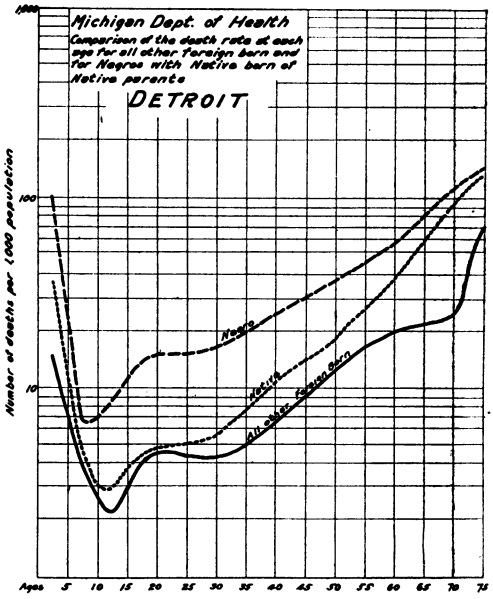


FIGURE VII



erably below, except in the group 20 to 24 where it is slightly higher, from then on it is considerably below again.

In the consideration of the German, Figure VI, there were practically no German born residents below the 15 to 19 group. At this particular point it coincides very closely with the control, but from then on it is very much lower. The native born of German mothers starts very much below in the under 5 group and is continuously below the control, but after the age of 19 is above the German born.

In the next chart, Figure VII, we show the foreign born of all other nationalities and it will be observed that this curve is continuously below the control, although in the group 5 to 9 and 20 to 24 it approaches closely, but at all other ages it is considerably below.

The negro curve which is shown on the same chart starts very much higher than the control and is notably higher at all ages.

From this finding we must conclude, then, that the Polish stock tends to increase the death rate materially at all ages. The Canadian stock which, however, is not distinctive enough in its racial characteristics to be of great value, is so closely in accord with the native stock that it will not materially affect the death rate one way or another. The German stocks on the other hand show the tendency towards the production of an exceedingly favorable rate.

It is to be regretted that the material is not available to make a more definite study of the other race stocks, but it is only possible to group them, and we must conclude that on the whole they tend toward the production of a favorable rate. The negro stock, however, is an exceedingly unfavorable one for the death rate. This, of course, is not peculiar to Detroit, as it is the history of this race wherever found, but certainly the climatic conditions must be considered an important factor in this group because of the fact that the respiratory diseases show exceedingly high rates.

A great deal of time has been spent in the study of the various diseases in their relation to these race stocks, but this introduces so many complicating factors that we are unable to reduce it to the limits of this paper. We desire to com-

ment briefly, however, on one particular disease, namely, tuberculosis.

Because all diseases have a greater or less virulence in relation to age groups, any study of any disease must consider this relation and in order to reduce this to a factor that will be easily shown and readily understood, we have determined what we have called an expectancy by taking the percentage of the population of each nationality for each age group. This is illustrated in Table VII, which gives the percentage of the population according to nativity in each age group, together with the percentage of tuberculosis deaths which occurred in this nativity and age group.

TABLE VII

PERCENTAGE OF POPULATION ACCORDING TO NATIVITY IN EACH AGE GROUP TOGETHER WITH PERCENTAGE OF TUBERCULOSIS DEATHS

Age	Native White of Native Parents		Born in Poland		Born in Canada		Born in Germany		All Other Foreign Born	
	Per cent Expectancy	Tuberculosis	Per cent Expectancy	Tuberculosis	Per cent Expectancy	Tuberculosis	Per cent Expectancy	Tuberculosis	Per cent Expectancy	Tuberculosis
0–4	39.3	39.0	.05	.0	.52	2.7	.02	.0	.87	1.3
5–9	37.9	50.0	.55	.0	1.27	3.8	.14	.0	4.14	.0
10–14	34.9	21.4	1.4	.0	1.9	14.3	.4	.0	8.7	.0
15–19	35.3	31.1	2.0	3.3	3.1	3.3	.9	.0	12.0	16.7
20–24	36.2	33.3	3.6	1.9	4.2	2.5	1.1	.0	15.9	12.6
25–34	30.4	27.3	6.2	11.9	4.7	4.7	2.0	1.4	24.3	12.7
35–44	26.7	27.0	5.4	13.2	6.3	4.2	5.0	3.0	27.6	21.0
45–54	24.6	24.7	4.2	16.5	7.3	7.2	10.0	2.1	24.8	26.8
55–64	21.9	23.2	3.4	16.1	8.3	5.4	17.1	10.7	24.4	19.6
65 plus	47.3	21.7	4.3	.0	13.6	21.7	44.2	17.3	60.7	17.3

Age	Mother Born in Poland		Mother Born in Canada		Mother Born in Germany		Negro	
	Per cent Expectancy	Tuberculosis	Per cent Expectancy	Tuberculosis	Per cent Expectancy	Tuberculosis	Per cent Expectancy	Tuberculosis
0–4	10.7	10.8	4.8	5.4	3.5	1.3	2.3	24.0
5–9	9.5	19.2	5.2	11.5	5.9	.0	2.5	11.5
10–14	6.5	14.3	6.6	7.2	9.7	7.2	2.8	21.4
15–19	4.2	5.6	6.6	5.6	12.5	8.9	3.9	16.7
20–24	2.3	9.4	5.1	5.0	10.6	9.4	6.1	19.5
25–34	1.2	3.6	4.3	2.9	9.6	10.4	5.4	15.5
35–44	.5	.6	3.7	4.8	8.2	6.0	5.2	14.4
45–54	.2	.0	3.1	1.0	8.9	5.1	4.0	10.3
55–64	.1	.0	2.2	.0	8.2	7.1	2.0	3.6
65 plus	.0	.0	3.3	.0	7.1	13.0	3.3	4.3

In the native white of native parents we find the rate in the group 5 to 9 to represent an excess of 32 per cent for the expectancy; in the group 35 to 64 it is just about equal to the expectancy; and at all other ages is below. In the Polish born we find in the group 25 to 34 an excess of 92 per cent above the expectancy, in the age 35 to 44, 144 per cent above the expectancy, at the age 45 to 54, 292 per cent in excess of expectancy and in the age 55 to 64, 372 per cent. In the Canadian group up to the age of 15 the rate is notably higher than the expectancy. In the group 15 to 19 only 6 per cent above; at the age of 20 to 24 it is 37 per cent below the expectancy; at the age 25 to 34 it is just the expectancy; and from 35 to 64 much below. In the German born, tuberculosis is much below the expectancy at all ages. In all other foreign groups we find that in the age 15 to 19, 39 per cent above the expectancy, and from 20 to 44 much below; at age 45 to 54 slightly higher, and above this age much below. In the case of native born of Polish mothers the rate is materially higher at all ages. In the native born of Canadian mothers up to the age of 14 the rate is higher than the expectancy; from 15 to 34 it is below, and from 35 to 44 is above. In the native born of German mothers the rate is consistently below the expectancy at all ages except in the group 25 to 34, where the excess is about 10 per cent. In negroes the rate is excessively high and far above the expectancy at all ages.

The limitations of time and of data prevent more intensive study of this subject, but we must conclude that the factor of nativity is a vital one, and in framing our immigration laws due consideration

should be given to the effect of race stocks on our public health and our death rate.

It must be realized that the characteristic of every race and every nationality is the desire to live its own life, to make its own rules and to preserve those customs and traditions which heredity has given it. The ability of a state to establish a similarity of customs, to reconcile opinions and to promote new ideals to the exclusion of those inherited and decadent, determines its health, its unity and its longevity.

The permanence of the state and the health of its people rest upon its powers of homogeneity.

DISCUSSION BY EDWIN W. KOPF, FELLOW A.P.H.A.

Dr. Deacon's paper has the notable aspect of being the first systematic attempt to set forth some of the more obvious elements of Michigan mortality since Dr. Henry Brooks Baker presented his essay on the mortality in Michigan before this Association at its annual meeting in Philadelphia, November 10, 1874. Students of public health history have often wondered why there have been so few historical and critical studies of the results of public health work in Michigan. Michigan has had, perhaps, as favorable an experience with modern public health measures as any other state in the Union, except Massachusetts. It seems desirable, therefore, to suggest that Dr. Deacon's effort will be followed shortly by historical or critical papers from his own office or from others in the Michigan Department of Health.

The paper by Dr. Henry Brooks Baker more than 50 years ago dealt particularly with a life table analysis of the Michigan death rate. He prepared the first life table for Michigan and this was one of the few tables of this sort available for American populations up to that time. The only life tables which preceded Baker's were the Wigglesworth Table (Massachusetts—1789), the Adrain Table for Philadelphia (1807), the Elliott Table for Massachusetts (1855), and the somewhat unsatisfactory table for the United States prepared by Elliott for the year 1870. Dr. Baker's effort in preparing a life table for Michigan represented rare initiative. It is regrettable that the vital statistics records for the State of Michigan for the past 50 years have not been more thoroughly exploited. Perhaps it is not too extravagant to hope that Dr. Deacon's paper is only the first of a series representing a revival of interest in localized studies of mortality, particularly for Michigan.

Dr. Deacon's display of facts on the mortality of the several race stocks constituting the Detroit population is interesting also because it is a continuation of studies which began with General Francis A. Walker's paper[1] before this Association at its annual meeting in 1873.

More than 50 years ago General Walker discussed the relations of race and mortality in the United States, using the census returns of 1870. Discussions of the racial factor in American mortality were continued in later years by Billings, Willcox, Hoffman, Bushee, Dublin and Baker, Davis and others. Dr. Deacon, therefore, has forged another link in this chain of studies of the more intimate aspects of the mortality problem in American communities. It may be well to suggest that if the data are available in Dr. Deacon's office, a study should be made of the race stock factor in mortality for the entire State of Michigan. This would supplement the studies of Dublin and Baker for the States of New York and Pennsylvania for the year 1910 and would keep alive the interest of vital statistics students in this most important aspect of American mortality.

VITAL STATISTICIANS AND THE STATE UNIVERSITIES

How, and under whose auspices these studies should be made, is another question, however. The vital statistician in the state services is necessarily an administrative officer with little time at his disposal for the effective, and, at times, exhaustive analysis of the crude tabular returns. Perhaps it would be helpful if the Michigan State Department of Health would establish coöperation with the graduate school of the University at Ann Arbor and would encourage more graduate research into the population and mortality problems of the state. A successful plan of coöperation between the State Department of Health and the university would establish what vital statisticians have hoped for so many years—